our species go, are in habit, the stems of the first being generally naked below and the second being leafy, and in the seeds of *Dentaria* being on broad, and of *Cardamine* on slender stalks.

The species of the eastern United States are in need of revision and the following is submitted to the consideration of botanists.

1. CARDAMINE DIPHYLLA, Wood. Rootstock long and continuous; toothed; stem leaves two.

2. CARDAMINE HETEROPHYLLA, Wood. Rootstock interrupted, forming a chain of two or three narrow oblong toothed tubers; stem leaves two to seven, mostly three, alternate.—The forms with more than three leaves are *Dentaria maxima*, Nutt.

This and the next species it would sometimes be hard to separate, for the next is sometimes found with two leaves, and sometimes with three and these alternate instead of whorled.

3. CARDAMINE LACINIATA, Wood. Rootstock same as last; leaves mostly three in a whorl, sometimes only two.

Var. MULTIFIDA, James. Leaves two or three, alternate or whorled, the leaflets with narrow linear lobes.

I do not think this form, called *Dentaria multifida*, Muhl., can be be separated with justice from the *laciniata*. In a recent trip to Lookout mountain, Chattanooga, I found both forms in full bloom, although not growing together, and some were so exactly intermediate in the division of the leaflets that it was hard to decide what they were. The rootstocks of both are alike. The variety however grows in poorer soil than the species itself, and we can thus account for the finer division of the leaves. To take the extreme form of the species and the variety and compare them, one would be inclined to give to each specific rank, but when we find them shading into one another as gradually as they do, we can see no other plan than to consider the *multifida* as a variety of *C. laciniata*.

The other species of *Dentaria* of the United States will now be *Cardamine Californica*, *C. macrocarpa*, and *C. tenella*.

I have specimens of var. *multifida* and many other specimens for exchange for my desiderata.—JOS. F. JAMES, *Custodian Cin. Soc. Nat. Hist., Cin., O.*

GENERAL NOTES.

Viola Beckwithii, T. & G., var. trinervata.—This pretty little violet was first collected near Goldendale, Wash. Terr., April 1, 1878, and at different times since, and has been distributed in my sets as *V. Beckwithii*, var. The characters of this new variety may eventually entitle it to specific rank, but for the present it is retained under *V. Beckwithii*. The principal characters are in the more simply pedate leaves, with broader lobes, having remarkable callous tips, and three prominent nerves, very strong in the mature leaves, the lateral pair submarginal, sometimes five nerves, when the outermost are strictly marginal.—THOS. HOWELL, *Arthur, Oregon.*

Solanum Fendleri.—This, one of the new Mexican tuberous species, was given to me many years ago by Dr. C. C. Parry. I found the tubers quite hardy here in Philadelphia, which of course the common potato is not. It came up among the hardy border flowers several years in succession, and finally disappeared, probably through ground mice. Some of the roots developed to the size of Black Walnuts before I lost them. It was on this experience only that I thought Mr. Lemmon's discoveries may be of advantage. I have not seen his plants, nor do I know what species he discovered in Arizona.—T. MEEHAN.

Sensitive Stigmas of Martynia.—In *Martynia proboscidea* the stigmas, when touched, close quickly, probably within ten seconds (I regret not having timed them), but if there is no pollen between the lobes these soon *reopen*, and this may be repeated several times during the life of the flower; but if there is pollen between the lobes they *never* reopen. If a bee enters one of these flowers, without having previously visited another, he closes the stigma without introducing pollen and it soon reopens. But if he has previously visited another flower and is covered with pollen, he introduces some of it between the lobes of the stigma, which then never reopens. This may have been observed before, but at all events I think it will be worthy of note as a remarkable adaptation for cross-fertilization.—EDGAR B. HARGER, *Oxford, Conn.*

The Arizona Potato.—I have been quite interested in Mr. Lemmon's discovery last July of *Solanum tuberosum* in the Huachuca Mountains, Arizona, in flower, and later in fruit.

Turning to my herbarium I find I have recorded on the label to my specimen, "*Solanum tuberosum*, L., var. *boreale*, Gray. Syn. Fl. p. 227. Mt. Graham, Arizona. Alt. 9250 feet." The specimens were taken in August 1874 and were beyond doubt indigenous. They were in flower but some had tubers about three-fourths of an inch in diameter.

This variety Gray recognizes as his old *Solanum Fendleri*, and states distinctly that it is not specifically distinct from the potato plant.

There can be no question that henceforth we must regard the potato as an indigenous plant, in the mountains of our Southwest. J. T. ROTHROCK.

Dr. Torrey.—I was employed by Dr. Torrey, during the last year of his life, in some small botanical details of his herbarium, and then I had an opportunity of noting his marvelous skill in mechanical resources. It impressed me the more, perhaps, as nature has not endowed me in this way. During my sojourn at Columbia College, I saw the dear old man in the most intimate way, and loved him as did all his associates. Often returning to my room late at night, I have found the Doctor hard at work in the herbarium, all the windows shut down in the August heat, and he himself in his shirt sleeves. He preferred to suffer rather have his plants disarranged by the wind. Pointing to the well-loaded shelves of his priceless herbarium, he once said to me with his quaint, child-like manner, "That represents a deal of back-ache." I have since learned to appreciate the remark,—W. W. BAILEY.

Stamens of Heteranthera reniformis.—Mr. Fritz Mueller writes to *Nature* describing dimorphism exhibited by the stamens of *Heteranthera reniformis* and commenting on the probable benefit of such dimorphism. He says; "In *Heteranthera reniformis* there is one long stamen (belonging to the outer whorl) having pale bluish pollen, and two short stamens (of the inner whorl) with bright yellow pollen. The stigma stands generally on a level with the anther of the long stamen. When the white flower opens, the pistil and long stamen diverge, the pistil bending (almost without exception) to the right, and the stamen to the left; at the withering of the flower, they again approach each other, so that the stigma may be fertilized by the pollen of the long stamen. Visiting insects are attracted yet more to the yellow anthers of the two short stamens by their being placed close to a yellow spot, surrounded by a violet border, at the base of the upper petal. * * * * Fertilization is almost exclusively effected by the pollen of the longer stamens, while the shorter stamens serve only to attract pollen-gathering or pollen-eating insects. * * * The dull color of the long stamens serves to make them less visible to insects."

A New Puff-Ball.—In a recent number *Grevillea*, Dr. M. C. Cooke prints the description of a new puff-ball, from Ohio, which is of exceeding interest. It belongs to a long lost genus, described by Klotsch in "Linnæa" some fifty years ago and a puzzle to mycologists ever since. The following is the description:

CYCLODERMA OHIENSIS, *Cke. & Morg.*

Subglobosum, album, læve. Peridium glabrum, coriaceum, superne umbonatum, inferne radicoso-fibrosum. Columella subcylindrica, æqualis, capillitioque radiante alba. Sporis minutissimis, globosis hyalinis.

On the ground. Ohio, U. S.

About an inch in diameter, or less, columella two-thirds the height of the peridium, wholly white within.

The double peridium is very distinct, especially as the individual advances in age. The outer peridium is composed of rather coarse, irregular, contorted fibres, closely interwoven. The capillitium is an exceedingly delicate membrane, much folded and plicate. The spores are globose, hyaline, and very minute.

Some Popular Botany.—A writer who affects the style of Thoreau, gives us, in the March number of the *Century Magazine*, some curious notes on the habits of evergreen and deciduous trees. He takes occasion to say that "most persons are unreliable observers," a statement somewhat lacking in originality, but which connot be gainsayed. "People live in the country all their lives without making one accurate observation *about* nature." (May I suggest in extenuation that "observations about nature" at so much per page in a popular magazine pay better

than that modest, reticent study *of* nature in which many country people nevertheless indulge.)

"The evergreen trees in front of their doors, what do they know about their habits? Do the pine and hemlock shed their leaves? Not in any strict sense." May I ask in a vague sense what they do with them otherwise? "In the deciduous trees the new leaves *take the place of the old* (sic), *they come out in the axils of the old leaves* and the branch is reclothed each spring, even if no new shoots appear"!! Dr. Gray says that whatever is produced in the axil of a leaf when developed is a branch—but then Dr. Gray may be one of those unfortunates who miss their fact for lack of "a sharp eye" and capacity for "swift inference." "But none of the Coniferæ renew their leaves as do the deciduous trees." "If the tree (conifer) were to cease to grow it would probably (though of this I am not certain) cease to shed its leaves." Nothing like caution in stating a scientific hypothesis, but what sense is there in the foregoing? It may be said that a writer who uses language in such a loose way as to talk about the "molting season" of trees and "foresight in a weed" is not to be held to a close verbal construction. But the context of the passage from which I have quoted shows an effort toward hypercritical accuracy on the part of one who "holds his eye long and firmly to the point and will not be baffled."—A COUNTRYMAN.

Water Pores of Fuchsia.—In Bessey's Botany (1st Ed., p. 104) Mr J. C. Arthur figures a water pore from a leaf-tooth of *Fuchsia globosa* and mentions the fact that in the dark colored varieties there are several of these openings on each tooth. The accompanying figure illustrates a group of these as shown by a slide prepared by Miss Katie L. Bishop in the botanical laboratory of Purdue University. The number of these water-rifts is unusually large, seven surrounding *a*, the central pore, which commonly occupies alone the tip of the tooth. Several slides were obtained, showing two or three of these openings, but none approaching the number here figured. Inasmuch as the literature and illustrations concerning this subject are so very meager it is hoped that this figure, though not representing any great novelty, may be of use to whoever undertakes a fuller study of these interesting structures.—C. R. B.

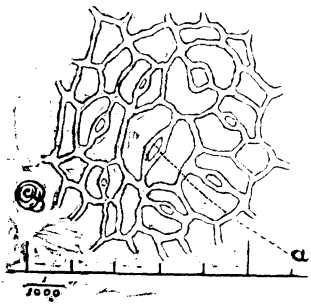

Fig. 1.—Water-pores from tip of tooth on leaf of *Fuchsia* (sp.?). *a*, central pore.

Schedule for the study of Cyperus.—I have found the schedule plan of approach so useful with difficult orders and genera that I constantly extend it to the examination of others. The young student is apt to see in a sedge or grass so much at once that is new and confusing that he may abandon the work in despair. If, however, he carefully writes

out the account of one thing at a time, he elimirates the element of doubt, as well as the too natural desire to compel the plant into some corner where his preconception supposes it to belong. Morever, by this plan, he actually studies the plant and bears away an idea of its structure and affinities, rather than a mere name. I have found the accompanying schedule for the genus *Cyperus* so useful in practice that I am induced to communicate it for the benefit of other teachers of our science.

SCHEDULE FOR CYPERUS.

The Roots. Note their character as indicative of the duration of the plant.

The Rootstocks. Note if present and whether tuberous.

The Culms. Describe as to section, height, surfase and color. Are they slender or stout?

The Leaves. Describe in ordinary terms of the leaf.

The Involucre. Of how many leaves is it formed? Describe these and state their length as well as the number and length of those of

The Involucels.

The Spikes. Are they in simple or compound umbels? Are they flat or terete? Give their general shape. Are they many or few-flowered? Are they appressed, spreading, or reflexed? State their color. Is the axis winged or naked?

The Scales. Describe their shape, margin, and apex. Note if they are empty. Are they keeled or not? Are they appressed or spreading? Are they nerved or not? Are they deciduous or persistent?

The Stamens. Give their number.

The Styles. How many times are they cleft?

The Achenium. Is it lenticular or triangular? Describe its general shape, and tell whether or not it is pointed.

The above is introduced by a general talk about the genus, with illustrations and diagrams. It has been put to the test of laboratory practice and stands the ordeal well.—W. W. BAILEY, *Brown Univ., Providence, R. I.*

Anthesis of Cyclamen.—I have been much interested in watching in my window garden the anthesis of this beautiful plant. At first it consisted of nothing but a thick cluster of heart-shaped or almost reniform radical leaves rising from a half buried corm, which, we are told, has been developed even in the seed. Hidden among the leaves could be found numerous nodding flower buds, giving but little promise of their future beauty. For several weeks the plant seemed to be engaged in storing energy, no surface change appearing. Suddenly the one-flowered peduncles began to elongate and grew with wonderful rapidity, carrying the buds far above the leaf cluster, until a length of 8 or 10 inches had been attained. In some cases all this growth was accomplished in

24 or 48 hours, the stem increasing in diameter as well as in length; in other cases it took longer. No finer example of rapidly dividing cells can be obtained anywhere than is furnished by these elongating peduncles. Then comes another resting period, after which the convolute petals begin to elongate, gaining nearly their full length while still rolled together. Presently a loosening up is noticed near the middle of the roll of petals, the edges beginning to free themselves from any overlapping and thus giving elbow room for the next movement. As is very well known the petals are strongly reflexed, just as in *Dodecatheon*, and I was somewhat curious to see how the reflexing took place. Closely as I watched, several buds opened without my catching a glimpse of the manner; but finally I was rewarded by seeing the reflexed position gained in a variety of ways. The usual way seems to be for the two upper petals to fly back suddenly like liberated springs, and the remaining three to come back slowly one at a time, with an almost imperceptible movement, always in the same order, the innermost petal being last. Sometimes, however, all five spring back at once, spreading out like the rays of a star, and then usually the two upper ones become at once completely reflexed, leaving the other three to assume the position gradually. There seems thus to be a combination of a simple mechanical movement, the sudden springing from a confined position, and a vital movement which brings the released petals slowly back to the required position. Mr. Darwin[1] has spoken of the movement of the peduncles in bending downward and burying the pods and this movement was beautifully shown in the specimens examined, and the circumnutation was also very noticeable. Circumnutation in the slow movement of the reflexing petals is very evident, as they describe quite a sensible arc before settling into their permanent positions and even then continue it and become quite twisted. This might partly be due to their having been in the convolute arrangement in the bud, but this cannot entirely account for it, and may not this very convolute arrangement look to circumnutation at least as an abettor, and the tension which causes the upper petals to spring back when released be stored up by its restraint? So then this same *Cyclamen Persicum*, which yielded to Darwin illustrations of movement in cotyledon, peduncle, and leaf, continues the story in the petals.

It might be interesting in this connection to note the presence of cleistogamous flowers. In some the peduncles never elongated, but in one it grew as rankly as those of other flowers, and one stunted petal crept out of the calyx-tube, but that was all. The stamens though were full to bursting of pollen, which does not look like cleistogamy, and the pod was the best formed of all and full of seed. It would seem as if all the cleistogamous flowers should have elongated peduncles if the habit of burying the pods is to be preserved.—J. M. C.

[1]Power of movement in Plants, p. 433.